# USSR
# ELECTRONIC AND PRECISION EQUIPMENT

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# USSR ELECTRONIC AND PRECISION EQUIPMENT

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# I. ITEMS OF SPECIAL INTEREST

## A. Civilian Radio and Television Production

In 1957, 4,263,000 radio receivers and television sets were produced in the USSR. This compares with 4,254,000 produced in 1956 and 4,025,000 produced in 1955. (Mezhdunarodnyy Politiko-Ekonomicheskiy Yezhegodnik (International Political and Economic Yearbook), Moscow, 1958, p 264)

[Comment: If the above figures are correct, the growth rate of the production of this equipment has slowed down considerably].

During the Seven-Year Plan, 4.6 times as many television sets and 1.7 times as many radio receivers will be sold to the USSR populace as were sold during the preceding 7 years. (Moscow, Sovetskaya Potrebitel'skaya Kooperatsiya, Jan 59, p 3)

## B. Plants

The Sumy Electronic Microscope and Electroautomatics Plant (Sumskiy zavod elektronnykh mikroskopov i elektroavtomatiki) needs a chief designer experienced in the fields of electronic microscopy and mass spectrometry.

Applications should be made to the plant at Komsomol'skaya ulitsa 68-a, Sumy, Ukrainian SSR. -- Advertisement (Moscow, Moskovskaya Pravda, 9 Oct 58)

[Comment: This appears to be a new plant.]

In the summer of 1957, some television equipment plants began to publish technical information bulletins called "Aids for Technicians." These bulletins were published to familiarize technicians with new types of television equipment.

Bulletin No 1 of the Moscow Television Equipment Plant was devoted to technical problems connected with the operation of Rubin-A and Yantar' television sets. Bulletin No 2 also gave information on these sets, but had a detailed description of Yantar' television sets.

Technical Bulletin No 1 of the plant [not further identified] producing the Start television set began with articles by engineers V. V. Shumov and G. A. Zyrin, who gave detailed information on the Start. A second article on design improvements in the Start was written by engineer P. M. Morgunov.

It is hoped that other television plants will follow the example of the above-listed plants. (Moscow, Radio, Dec 58, p 15)

[Comment: The producer of the Start television set has not been determined from available published sources.]

C. Deficiencies and Shortages

A lead article published in Leningradskaya Pravda on 17 August indicated that lantern batteries produced by the Leningrad Leninskaya Iskra Plant were being rejected by consumers. The plant party bureau has investigated and found the criticism valid, whereupon production and quality-control methods have been improved.

The same article also mentioned the damaging of plastic parts for electrical components at the Leningrad Electrical Machinery Plant. V. Inkinen, plant director, has announced that the guilty persons have been brought to account and that the storage of materials has been improved. (Leningradskaya Pravda, 1 Oct 58)

According to Trifonov, Deputy Minister of Trade USSR, his ministry has taken steps to improve the supply of radio components to the populace. However, one cannot help but agree with him that the enterprises of the radio engineering industry are still highly unsatisfactory in their supply of components to trade organizations. For example, DGTs21 and DGTs27 transistors and SNVK resistors are not sent to the trade network at all. Only insignificant quantities of 5Ts4, 6B8, and 6A7 tubes; band switches; circuit coils; volume controls; control knobs; and seven- and nine-pin tube sockets are made available for sale. The situation with regard to 18LK and 23LK picture tubes, output and power transformers from 70 to 120 watts in power, components for KVN-49 television sets, and sound heads for phonograph pickups is especially bad.

According to information from the Ministry of Trade USSR, during the first 7 months of 1958, the Moscow plant [unidentified] where Glagolev is director turned over a mere 62 power transformers and 300 sockets for G-807 radio tubes to the trade network, although according to the 1958 plan the plant was to have supplied 1,000 transformers and 20,000 sockets.

The Minsk Plant [unidentified] where Shapoval is director was to have turned over 2.6 million rubles' worth of parts to trade organizations during 1958; so far it has supplied only 135,000 rubles' worth. This is the picture of how radio components are supplied to the trade network.

Trifonov states that the Ministry of Trade USSR has requested the Council of Ministers USSR to require Gosplan USSR to explore the possibilities for producing various badly needed radio components and to turn these components over to trade organizations. Amateur radio builders are impatiently awaiting an answer to this problem. (Moscow, Radio, Nov 58, p 29)

When building short-wave and ultrashort-wave apparatus, radio fans often have difficulties in making high-quality antenna insulators. Good antenna insulators can be made out of seven-pin ceramic minature tube sockets. To do this, first drill through the center of the socket; remove the cap holding the contacts; yank out the contacts with pliers; replace the cap; and put a brass bolt through the center hole. To keep the insulator from cracking when the bolt is tightened, a rubber washer should be used. The insulators are then mounted in the same way as ceramic sockets are. -- B. Filimonov, Cheboksary (Moscow, Radio, Dec 58, p 26)

[Comment: This is rather a complex way to make simple antenna insulators.]

D. Personnel

M. S. Likhachev is deputy chairman of the Scientific and Technical Council of the State Committee for Radioelectronics of the Council of Ministers USSR. (Moscow, Vestnik Svyazi, Jan 59, p 28)

## II. LOCAL PRODUCTION AND ORGANIZATION

### A. Leningrad

Leningrad is considered to be one of the largest USSR centers possessing highly skilled workmen, who turn out high-precision apparatus and instruments.

The Leningrad Analytical Instrument Plant will significantly increase its output of equipment for the petroleum and coal industries and for transport organizations. The Metallist Machinery Plant will produce dozens of new instruments for the chemical industry. The Etalon Plant will supply large single-design equipment for Soviet astronomers. Leningrad enterprises will produce high-power microscopes, speedometers, and automatic meters; all types of optical, electrical, radio, and vacuum-tube measuring instruments; thermal regulators; communications instruments; and automation equipment.

Leningrad instrument makers are justifiably proud of their participation in the production of the new synchrophasotron, which was installed at the Joint Institute for Nuclear Studies at Dubna.

The Leningrad Svetlana Plant produces all types of light bulbs and vacuum tubes. It is now solving the very important problem of organizing the mass production of semiconductors.

Leningrad scientists, engineers, and workers are making a great contribution to the development of radio relay communications. Leningrad enterprises are already mastering the production of equipment for radio relay lines for long-distance multichannel telephone and telegraph communications, for long-distance transmission of network television programs, and for various types of official communication. Before the 1957 celebration of the 250th anniversary of Leningrad, the Lenteplopribor Plant mastered the production of new instruments, including an electronic $p^H$ meter and an electronic synchrometer.

Leningrad instrument makers intend to increase sharply their production of various equipment based on the use of ultrasonic oscillation. Soviet scientists have already achieved ultrasonic frequencies exceeding 10 million cycles per second. (Eto Budet v Leningrade (It Will Be in Leningrad), book compiled by Ye. I. Mikhlin, Leningrad, 1958, pp 107-134)

### B. Moskovskaya Oblast

Inept planning has an adverse effect on the operations of some of the plants under the Moscow Oblast Sovnarkhoz. The [Teplyy Stan] Mosrentgen Plant, for instance, was given an assignment for the production of an experimental model of a portable industrial gamma-ray unit during the third

quarter of 1958. This assignment originated with Gosplan RSFSR. The plant was notified of the assignment ahead of time; however, since July 1957, it has been haggling with the Leningradskiy Sovnarkhoz to no avail, since it still does not have a technical order for designing the gamma-ray unit and does not know who the consignee will be. In addition, after a year of procrastination, it has been decided that gamma-ray units with radioactive sources are unsuitable and that other gamma-ray units have to be designed and produced. Thus, all the plant's efforts expended in preparing for the production of the gamma-ray units have been in vain.

In 1958, the same Mosrentgen Plant was to have begun the production of an industrial consignment of diagnostic X-ray units with electronic-optical amplifiers. Blueprints of these units have already been made and an experimental model has been built. However, Gosplan RSFSR has not decided who will supply cathode-ray tubes for the new units.

In its 1958 plan, the Mytishchi Elektroschetchik Plant was to have developed an experimental model of a miniature single-phase meter and was to have readied it for production in 1959. The plant is almost finishing up this assignment. However, the Division of Electrical Engineering Industry and Instrument Making of Gosplan USSR has demanded that these electric meters be taken out of production.

The Mytishchi plant is also supposed to master the production of two-rate meters for rural areas. It has finished an experimental model of such a meter and could begin its production at any time. However, Gosplan RSFSR has assigned the development of the clockwork for this meter to a special design bureau which will not make it until 1959. The enterprise which is to series-produce the clockwork has not yet been chosen.

The [Orekhovo-Zuyevo] Pribordetal' Plant is mastering the production of new type VTsP-25 dial scales, which were developed by the Design Bureau for Testing Machines of Gosplan RSFSR. These scales consist of two basic units: the dial indicator produced by the Kokchetav Machinery Plant of the Severo-Kazakhstanskiy Sovnarkhoz, and the platform and column unit made by the Pribordetal' Plant. The Pribordetal' Plant is ready to produce its part of the scales; however, the Kokchetav plant has failed to organize the production of dial heads.

Much nonstandard equipment is needed for mastering the production of new products; it is impossible to place orders for such equipment, even through interplant cooperation. For example, the Klin Thermometer Plant is unable to introduce five special automatic machines into its production processes. The machines had been designed long before by the Design Bureau for Medical Instruments; however, the plant is unable to procure the nonstandard equipment it needs to put them into operation.

The Savvino Electrical Machinery Plant placed orders for the production of compound dies for stator and rotor irons with the Domodedovo Machinery Plant (Domodedovskiy makhanicheskiy zavod), which is not properly equipped for such manufacture. As a result, each set of dies made by this plant costs 27,000 rubles, while the same compound dies made by enterprises of the Khar'kovskiy Sovnarkhoz cost 4,000 rubles per set.

During the third quarter of 1958, the Podol'sk Cable Plant was to have put into operation a semiautomatic line for the production of rubber compound. The line has been installed completely. However, there has been delay in putting the line into operation and giving it an over-all test because the plant lacks various electrical equipment and materials.

The State Scientific and Technical Committee of the Council of Ministers USSR and the committees under the Council of Ministers USSR which are in charge of various branches of industry should be more precise in seeing that the state plan for new technology is drafted correctly. The plan should give definite assignments to the sovnarkhozes, which will develop them and make out assignments for the proper branches of industry. After the plans are reviewed in detail by the sovnarkhozes and their technical and economic councils, the assignments should be reviewed and coordinated by the gosplans of the republics and by Gosplan USSR. -- M. Blagushin, Deputy Chief Engineer, Administration of Electrical Engineering Industry and Instrument Making, Moscow Oblast Sovnarkhoz (Moscow, Leninskoye Znamya, 20 Sep 58)

C. Latvian SSR

In the theses of his speech before the 21st Congress of the CPSU, N. S. Khrushchev stated that the development of the electrical and radio industries is one of the most important tasks facing the Latvian SSR. Many changes will occur in the republic during the Seven-Year Plan. Production volume will be nearly tripled during that time.

The Riga Electrical Machine Building Plant [REZ] will be considerably expanded and will supply traction and illumination equipment for railroad rolling stock. The Riga Electrical Machinery Plant will double its 1958 output of electrical installation equipment. The Illumination Engineering Plant (Svetotekhnicheskiy zavod), which supplies fluorescent light fixtures, will triple its capacity.

To reduce the Latvian electrical industry's dependence on cable and insulation materials from other parts of the USSR, it is planned to construct plants for the production of cable products and insulation materials. However, the start of construction of these plants is still in the distant future; they should be constructed 2 years earlier than specified in the plan.

During 1965, the Riga VEF Plant and the Riga Plant imeni Popov will produce 700,000 radio receivers, although their production space will undergo no significant expansion. The Plant imeni Popov will produce four times as many radios in 1965 as in 1958. Each year, it will put a new high-class radio receiver into production.

The production of radio apparatus, telephones, automatic telephone exchanges, and other equipment is concentrated at the Riga VEF Plant, one of the largest enterprises in the Latvian SSR. In actuality, this plant encompasses many branches of production, which makes automation, mechanization, and supply difficult. The VEF Plant should be specialized. It should be relieved of the production of telephones and a special plant for their production should be created. The sooner this specialization is put into effect, the better it will be for the development of radio and telephone manufacture in Latvia. -- Ya. Damburg, Chief, Administration of Radio Engineering and Metalworking Industry, Latvian Sovnarkhoz (Moscow, Sovetskaya Latviya, 30 Dec 58)

D. L'vov

The [L'vov] Gas Apparatus Plant has been specializing in the production of household gas appliances. In 1958, plant production increased to 3.5 times that of 1957 and its cost decreased significantly.

The [L'vovskiy] Sovnarkhoz has specialized a number of other enterprises, e. g., the [L'vov] Measuring Instruments Plant, which now produces L'vov television sets. This enterprise will produce 150,000 television sets per year at the end of the Seven-Year Plan, as contrasted to 13,700 sets in 1958. This plant's production comprises 75 percent of the output of all republic television enterprises. (Kiev, Kommunist Ukrainy, Jan 59, p 25)

## III. TUBES AND TRANSISTORS

The further development of communications in the USSR, as outlined in the theses of Khrushchev's speech for the 21st Congress of the CPSU, is closely connected with the development of the USSR radio engineering industry and, above all, of the vacuum tube industry, since radio tubes and semiconductors constitute the basis of any electrical engineering system, device, or apparatus.

The development of multichannel radio relay communications lines as a more effective means of long-range transmission of television programs and the organization of hundreds of telephone channels require the improvement of existing types and the development of new types of radio tubes. Such tubes must be of high quality and must have increased service lives (10,000-20,000 hr). This is especially important because most intermediate points of radio relay communications lines will be inaccessible. The service life of a traveling wave tube, such as those used in radio relay apparatus, should be at least 10,000 hr. It would be advantageous to use either electrostatic or permanent magnet focusing of the electron beam.

A basic principle, the reduction of the number of types of tubes used, must be observed in the development of apparatus for communications enterprises. Besides this, it is imperative to use tubes with long service lives which are specially manufactured for the Ministry of Communications. This would permit an increase in the reliability of operation of communications media and lead to a minimum number of stoppages for technical reasons.

An increase is to be achieved in the power of radiobroadcasting stations through extensive application of new types of high-power demountable tubes as more economical vacuum tubes, and this will also cut operational costs of radio enterprises. These tubes can be used to particular advantage in radio stations located far from industrial centers. The designers and scientific workers of the vacuum tube industry must offer much assistance in this important task.

At present there is a shortage of good 0.5-, 1-, 5-, 10-, and 20-kw modulator tubes at high-power wired radio units and broadcasting stations. The vacuum tube industry must develop a set of high-quality modulator tubes with forced-air cooling for new transmitters and with water cooling for the modernization of previously produced transmitters.

The development of 3-, 25-, and 50-kw forced-air-cooled beam tetrodes with activated cathodes is an urgent task, and it is necessary to continue development of powerful metal-ceramic tetrodes with forced-air and water cooling and with capacities of 5 kw or more at operating frequencies of 300-500 and 1,000 mc for use in television transmitters.

The radio engineering industry should produce powerful sealed-off tubes with long service lives (at least 10,000 hr) and activated cathodes, while achieving reduction in costs and prices of vacuum-tube products. It should keep in mind during the design stages the possibilities of rebuilding burned-out tubes, the advantages of which have been substantiated by considerable experience on the part of the Ministry of Communications.

Provision should be made in the new tubes for less heating load on the glass of the tubes and for greater volume of heat expulsion via small radiators for natural lead-off of the heat. As a rule, high-power tubes should not have to be aged at radio stations, and should have inexpensive radiators for forced-air cooling (with about 60 mm of the water column pressure loss in the radiator) and increased cooling surface area.

The production of high-power klystrons must be expanded.

With the aim of further research into the most economical cooling systems, the Main Radio Administration of the Ministry of Communications and the vacuum tube industry should test high-power tubes with evaporation cooling (vapotron) [probably evaporation-cooled tubes] at one of the radio stations. -- Engr N. V. Zaryanov (Moscow, Vestnik Svyazi, Jan 59, p 11)

During the Seven-Year Plan, the radio tube shop of the Moscow Electric Bulb Plant expects to sharply increase its production of the most modern types of various receiver-amplifier tubes. In 1959 alone, its volume of production should be doubled.

The shop's production will be developed through the replacement of socket-base and miniature receiver-amplifier tubes with subminiature types and, what is most important, through the introduction of new improved pentodes with large characteristic curves, duo triodes and diodes, and economical heater tubes with 3-volt filaments.

The shop is faced with the task of increasing the reliability of its tubes more than fivefold. It has made the first steps in this direction already; subsequent steps will be taken in cooperation with other shops. All work will be accomplished without adding production space and with existing equipment.

At present, both in the USSR and abroad, radio tubes are assembled for the most part manually. The plant will endeavor to inaugurate advanced work methods for its employees, and in 1962 it expects to install a semiautomatic line for the assembly of subminiature tubes in the radio tube shop. This line is in the final stages of development at one of the scientific research institutes for vacuum tube machine building (nauchno-issledovatel'skiy institut vakuumnogo mashinostroyeniya). It will enable the shop to quadruple its present production of radio tubes. -- P. Sidorenko, Secretary of the Party Bureau, Radio Tube Shop, Moscow Electric Bulb Plant (Moscow, Radio, Dec 58, p 3)

Assembly shop No 2 is one of the largest at the Leningrad Svetlana Plant. The 6P13S, 2D1S, and GU50, tubes are assembled in this shop. Initial processing shop No 17 supplies heater filaments for GU50 tubes to shop No 2. N. G. Zak is chief of the shop. Ye. M. Shpakov is plant director.

The plant went on a 7-hour workday basis at the beginning of February 1958. (Rabocheye Sobraniye na Predpriyatii (Workers Meetings at an Enterprise), Leningrad, 1958, pp 40-68)

The Scientific Research Institute of the Radio Engineering Industry has developed a semiautomatic machine for checking the electrical parameters of radio tubes. This device replaces the work of four testing sections equipped with 12 stand installations attended by eight persons. All operations of the checking cycle are performed automatically, with the exception of loading and unloading the magazines [of the checking device]. More than 1,680 tubes can be checked per hour in this semiautomatic, which is attended by two persons. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 26 Sep 58)

Although the production of transistors began only a few years ago in the USSR, this country was able to place an exhibit in almost all types (gruppy) of modern series-produced semiconductors at the Brussels World's Fair. Such semiconductors included low-frequency triodes up to 100 watts in power and high-frequency triodes working in bands up to several hundreds of megacycles. Germanium and silicon diodes for currents up to 500 amp and back voltages up to 1,000 volts, selenium rectifier components with back voltages of 60 volts, controlled and stabilized diodes, and many other semiconductors were also exhibited in Brussels. Other semiconductors exhibited included photoresistors for automatics and sound motion pictures; various thermistors, including those designed for measuring the temperatures of internal organs; and thermoelectronic instruments for semiconductor refrigeration units.

In the opinion of radio specialists visiting the fair, many Soviet semiconductors were superior in quality to similar devices made in foreign countries. -- Aleksandr Ivanovich Shokin, First Deputy Chairman, State Committee for Radioelectronics, Council of Ministers USSR (Moscow, Radio, Nov 58, p 15)

Along with the development of new methods for the production of semiconductors and the improvement of manufacturing processes, other progress in the semiconductor field has made it possible to develop semiconductors of fairly high power which possess high electrical parameters and are capable of operating under difficult climatic and mechanical conditions.

The type 207 high-power germanium transistor (1), which has been developed, has permitted a more extensive application of transistors in apparatuses driven by powers over one kw. It can operate with currents up to 20 amp.

The new transistor can be used in various radio and electrical installations. The use of high-power transistors in circuits of converters of low-voltage DC into high-voltage DC or into AC is extremely important. In such a case the transistor operating in a push-pull circuit converts power in the order of one kw with internal losses of about 15-20 watts.

The transistor is also economical when used in contactless circuit breakers and starters. It can be used in servoamplifiers and modulators; a regulator in voltage stabilizers; and in various regulators of electrical machinery. It is also possible to utilize the new transistor in the circuit of an ultrasonic frequency oscillator for various ultrasonic installations and high-frequency heating.

(Source contains additional information on high-power transistors.) (Moscow, Elektrichestvo, Jan 59, pp 72-75)

(1) Photo available in source, p 73

## IV. RADIO

### A. Research and Development

The IRPA (Scientific Research Institute of Radio Reception and Acoustics) has developed acoustic systems for radio receivers utilizing standardized parts, which reproduce sound frequencies ranging from 40-60 to 12,00-15,000 cycles per second.

The Ametist table-model radio receiver produced by the Riga VEF Plant has an acoustic system consisting of two low-frequency 4GD-1 speakers on the left side of the front panel, a ZGD-7 medium-frequency speaker on the right side of the front panel, a VGD-1 high-frequency speaker in the middle of the front panel, and two VGD-1 or 1GS-9 loud-speakers installed on the side panels of the set. The acoustical system of the Kristall console radio-phonograph, also made by the VEF plant, is identical to that of the Ametist. (Moscow, Radio, Nov 58, p 33)

B. Semenov is chief engineer of the IRPA, which is located in Leningrad. For several years, the IRPA has been working on the development of equipment for high-quality sound reproduction.

(Source gives substantial information on the IRPA's activities). (Moscow, Radio, Dec 58, p 8)

### B. Transistor Radios

Engineers Al'bert Brach and Yuriy Izak of the Riga VEF Plant have developed a dummy model of a transistor radio. This new battery-powered set is mounted in a Turist radio cabinet. It has an internal ferrite antenna and a folding external antenna for short-wave reception. Its radius of operation in the long- and medium-wave bands within 1,000 km, and it will pick up short-wave broadcasts originating in Moscow and other broadcast centers from any point in the USSR. The radio, together with batteries, weighs 2.2 kg.

Instead of tubes, the new radio has nine transistors which are good for 20-30 years of operation at great savings in electric power. The batteries consist of six Saturn cells, which supply current for 200 hr of operation. It may also be powered by ordinary flashlight batteries, or by small 2D-0.2 batteries which are easily charged with house current.

Until now, the seven-tube Class-2 Rodina had been considered the best battery radio, but the sensitivity and other qualities of the new transistor radio are superior to those of the Rodina, and even approach Class 1.

Almost all modern high-class and Class-1 radio receivers are designed and produced with remote-control devices. These will also be available in the new radio, for which new removable speakers have been designed so that they may be moved about a room independently of the radio. The high sensitivity of this set will also permit the use of standard or long-play phonographs with it.

The Latvian Sovnarkhoz has approved the dummy model of the new transistor radio and has allotted funds for development of an industrial model for series production. (Riga, Sovetskaya Latviya, 28 Sep 58)

A. Brach and Yu. Izak, engineers of the Riga VEF Plant, have developed a miniature radio receiver weighing only 2 kg, batteries included. When its antenna is unfolded, it can receive stations from nearly all over the world.

The receiver utilizes electron tubes. It is powered by six Saturn dry cells. In case such dry cells are not available, it may by powered by flashlight batteries or by small storage batteries.

The Latvian Sovnarkhoz has approved the experimental model of the new receiver and has allotted funds for its series production. (Moscow, Sovetskaya Rossiya, 3 Oct 58)

[Comment: This is apparently a summary of the same information given in the preceding account from Sovetskaya Latviya, 28 September 1958. However, since the account in the local is more apt to be correct, the other version seems to have been distorted by compression.]

A group of engineers of the IRPA under the leadership of S. G. Kalikhman has finished making experimental models of a new table model radio receiver, the Voskhod. This set is designed for operation in rural areas where no electricity is available. It receives local and distant stations on the long- and medium-wave bands.

The new receiver has eight transistors instead of tubes; it utilizes printed circuits and new materials, especially ferrites. The set measures 280 x 220 mm and weighs 3.5 kg.

The Voskhod has keyboard band switching and two knobs for volume control and tuning. It is supplied by four Saturn-type batteries. (Leningradskaya Pravda, 4 Oct 58)

The Sputnik portable transistor radio is designed for receiving programs on the long-wave and medium-wave bands. It has a permanent magnet speaker 72 mm in diameter. Its intermediate frequency converters and amplifiers and other parts are very small and light. The excellent Sputnik radio with its exceptional tone quality was designed by Soviet designers for radio amateurs. (Moscow, Sovetskaya Aviatsiya, 30 Dec 58)

The Sverdlovsk portable radio receiver is based on eight transistors in a superheterodyne circuit. The set utilizes an internal ferrite antenna and is designed for reception in the long- and medium-wave bands. It is fed by three flashlight batteries and its input current is approximately 23 milliamperes.

The Sverdlovsk's components are mounted by a printed circuit method. Its carrying case is made of plastic. (Moscow, Vestnik Svyazi, Feb 59, inside front cover)

C. Radio-Phonographs

The Minsk Radio Plant has prepared for the production of a modernized model of the Druzhba radio-phonograph. The new Druzhba consists of an 11-tube superheterodyne combination AM-FM radio receiver and a universal record player in a single cabinet. It is designed to receive AM broadcasts in the long-, medium-, and short-wave bands or FM broadcasts in the ultrashort-wave band, and for playing either standard or long-play phonograph records.

The acoustical system consists of four oval speakers which ensure equal distribution of sound in all directions.

The record player has a two-speed electric motor with semiautomatic on-off switching, and a piezoceramic pickup with two sapphire needles.

The Druzhba may be powered from any 110-, 127-, or 220-volt AC source. Input power for the radio does not exceed 80 watts; input for the phonograph is about 100 watts. The set measures 610 x 440 x 360 mm and weighs 27 kg. (Moscow, Novyye Tovary, No 12, 1958, p 4)

The Riga VEF Plant has developed the new Lyuks-2 radio-phonograph and and is getting ready to produce it. The Lyuks-2 has better electrical and mechanical characteristics than the currently produced Lyuks.

The most important changes in the set are in the ultrashort-wave unit, where the design and circuit system have been changed. Radiated voltage at the antenna terminals has been reduced to 20 millivolts, and frequency warm-up drift has been reduced to 10-40 kc per hr, after the set has been turned on for 5 minutes.

The pass band on the FM intermediate frequency channel has been narrowed to 140-160 kc, which has reacted favorably on the selectivity of the adjacent channel (46-50 decibels with 250-kc detuning), improved the signal-noise ratio on the grid of the fractional detector tube (lampa drobnogo detektora), and lessened the likelihood of false tuning.

In the three intermediate-frequency FM stages, a system of grid limitation is used instead of automatic volume control. Besides having advantages in interference reduction, the use of limiter circuits makes it possible to fully build each stage around the grid circuits, which in turn raises the stability of the FM channel.

The fractional detector circuit has been improved by lowering the load resistor to 15,000 ohms and by selecting the proper ratios for the phase inverter transformer and special measurements for balancing the circuit. The steps taken have helped to reduce parasitic AM and to increase the linearity of the detector characteristic.

The radio frequency unit of the short-, medium-, and long-wave bands of the AM channel have been modernized considerably. The short-wave spread bands have been further extended as follows: 9.36-12.1 mc; 5.9-7.4 mc; and 3.95-5.9 mc.

Selectivity on the image channel of the long- and medium-wave bands is now 66-80 decibels and 60-70 decibels. Signal attenuation at the frequency equal to the intermediate frequency is 50-56 decibels. The true sensitivity is 10-25 microvolts.

The resonance characteristic form and the selectivity of the intermediate-frequency AM channel have been improved and the design of the coils has been simplified.

Sound quality at low volume in the audio-frequency stage has been improved by changing the tone compensation circuits. Supply circuits of the set have been somewhat changed. The external appearance and the acoustical system of the set remain unchanged. (Moscow, Radio, Dec 58, p 17)

The Tallin Punane Ret Radio Plant has produced an experimental consignment of new high-class radio-phonographs (2). A model of this type of radio-phonograph was awarded a silver medal at the Brussels Fair. (Moscow, Ogonek, No 7, Feb 59, p 29)

(2) Photo showing building where these sets are assembled available in source, p 29, center, second from top

D. Radio Interpretation Apparatus

In connection with the impending Afro-Asian Writers Conference, which will be held in Tashkent, radio speech interpretation apparatus is being installed in the Theater imeni Alisher Navoi. Five short-wave receivers, each with a radius of operation of up to 3 km, have been installed in one of the loges. Interpretation will be made in sealed closed booths built on the stage.

Listeners in the theater will use miniature transistor receivers with earphones. The receivers are smaller than Kazbek cigarette cases, are supplied by a 1.3-volt battery, and are rated for 200 hr of operating time. One of them enables a listener to hear speeches made in any of eight languages accepted at the conference.

This is the first time that this new equipment will be used in Uzbekistan. Tests conducted on it have netted excellent results.

M. Ya. Oralkin, a senior technician of the Moscow City Radio Network, says that the new equipment was produced by the Leningrad Institute of the Radio Industry. Several more of these installations are being produced in addition to the order for Tashkent. (Moscow, Pravda Vostoka, 3 Oct 58)

E. Plant Information

In 1955, the Leningrad Metal Products Plant put 24,320 radio receivers on the market. In 1960, it will produce 50,000 radios. The production of radios will also be increased at other enterprises. (Eto Budet v Leningrade (It Will Be in Leningrad), book compiled by Ye. I. Mikhlin, Leningrad, 1958, p 185)

The Barnaul Radio Plant, a leading enterprise of the Altayskiy Sovnarkhoz, produces wired-radio units (3) designed for kolkhozes, sovkhozes, and clubs. (Moscow, Radio, Jan 59, 3d page of center folder)

(3) Photo available in source, 3d page of center folder, bottom, right

# V. TELEVISION

## A. General Information

According to the theses of Khrushchev's speech [for the 21st Congress of the CPSU], the number of television sets in operation by the populace of the USSR will increase by 12.5 million between now and 1965. To the television producers, this means an increase in output several times over the present level. But it is not possible to have merely a quantitative growth, without changing designs radically and adapting them to mechanized and automated production. A simple increase in the production of Rekord, Znamya, Rubin, Temp-3, and other sets currently in series production is not the way to go about it. None of these sets are suitable for mechanized and automated production, and it would be economically unfeasible to expand production space. Therefore, new television sets must be developed.

Two new types of television sets would be most suitable. The first is a type for mass use, costing no more than the KVN television set. The second is a medium class set with parameters meeting the standards for classes 1 and 2 television sets. At least 1.5 million sets of the first type and 200,000-250,000 of the second type should be produced each year. The chassis of the second type can be used in the small-series production of console models and combination sets.

The main and most difficult task is the development of a television set for mass use. The creation of this set necessitates the combined efforts of the best developmental teams in collaboration with scientific research technological institutes. The new set must be inexpensive, but must also conform to all modern requirements for a mass-type television set. It should be designed for automated and mechanized production. For this purpose, new tubes, dynamic speakers, plastic cabinets, a number of new units (special channel switch unit, line transformer, and deflection system), and other units and components suitable for installation on printed circuits in mechanized production must be developed.

Special attention should be given to lowering the input power of the set. One method for doing this is the replacement of tubes by transistors. The Soviet all-transistor television set displayed at the Brussels Fair had an input of about 15 watts, as compared with the average 125-130 watts consumed by an ordinary vacuum tube receiver.

One of the main tasks in the development of Class-2 television models is weight and size reduction, which will save materials used for their production. The solution of this task could be facilitated by using new picture tubes with deflection angles of 110 degrees.

The use of metal-glass picture tubes should be discontinued to simplify designs and cut costs. The heavy metal cone of a picture tube, which is always under high voltage, makes it necessary to have a more expensive and complex design. In addition, the production of metal-glass tubes costs much more than all-glass ones. There is no justification for using metal in a picture tube; its use is merely a reflection of the backwardness of glassmaking in the vacuum tube industry.

The use of picture tubes with deflection angles of 110 degrees in television sets also requires the development and production of the right types of scanning units, and the production of three new types of tubes.

Both the mass-type and the medium class receiver should have designs suitable for mechanized production. In particular, printed circuits for mounting components should be used.

Significant weight reduction can be achieved by using pressed plastic cabinets instead of those made of veneers. This will also bring about a significant reduction in labor consumption.

The proposals made here are not exhaustive by any means; there should be many more proposals. A creative approach toward the solution of the tasks set forth in the Seven-Year Plan will assure its successful fulfillment. -- D. Kheyfets, Chief of Television Division of [unidentified] Radio Plant (Moscow, Radio, Jan 59, p 12)

Enterprises of the Moscow City Sovnarkhoz have pledged to produce an experimental consignment of Almaz-102 television sets with 53-cm-diagonal picture tubes in December 1958; to considerably modernize a projection-type television receiver and produce an experimental consignment of such receivers by the end of 1958; to produce an experimental consignment of color kinescopes, and to develop a design for color television receivers. (Moscow, Tekhnika Kino i Televedeniya, Dec 58, p 3)

B. Mobile Television Units

Until recently, USSR industry had produced an insufficient variety of such television equipment as ultrashort-wave stations of 2/1, 5/2.5, and 15/7.5-kw capacities designed for broadcasting on the first five channels; standard studio equipment consisting of studio and motion picture transmitting apparatus for five channels; and type PTS-52 mobile television stations. Besides, a number of engineering ideas which have been incorporated into this equipment are already obsolescent. Therefore, this production will be terminated in 1959.

The production of new studio equipment for operation on four camera channels was started in 1957-1958. The Planning Institute of the Ministry of Communications has based the development of a series of prototype plans on this new equipment.

Production of new PTS-3 mobile television stations has been started. Shortcomings of the old PTS-52, such as the unwieldiness of the audio equipment which necessitates mounting it in a separate bus, the impossibility of separating the program staff from the engineers, and the inadequate number of microphone outlets, have been eliminated from the new stations. All of the equipment of the [PTS-3] station is installed in a single ZIL-158 bus, and the receiving equipment is at the television center.

A new and more modern PTS-59 mobile television station is currently under development. In this, extensive use is being made of units and equipment not only of small television centers but also of a multiprogram television center currently under development.

An interesting development is the new ARTU television reporting installation operating on a single channel in conjunction with the PTS-59. This unit is installed in a ZIM passenger car and is designed for reporting from streets, squares, and highways while the car is moving along at about 5 km/hr with respect to the object being televised. The ARTU operates at distances of up to 5 km.

The RTU pack-type portable unit is designed for operation from the PTS-59 mobile station at distances of not more 500 meters. Production of the PTS-59 mobile station and of the ARTU and RTU units will be started in 1959. (Moscow, Vestnik Svyazi, Jan 59, pp 6-8)

A group of specialists of the All-Union Scientific Research Institute of Television has developed a reporting television unit (RTU) which has a power source independent of the mobile television unit (PTS) that it serves and consists of two parts: the portable transmitting unit (PPU) and the stationary receiving unit (SPU).

(Source gives further information on the portable television unit.) (Moscow, Radio, Nov 58, p 17)

C. Color Television

Several variants of compatible color television equipment have already been developed in the USSR. For example, the State Scientific Research Institute of the Ministry of Communications USSR has finished developing a set of color television equipment (in four variants) and has equipped an experimental studio. Projection-type television receivers with three picture tubes and 90 x 120 cm and 30 x 40 cm screens have been developed. Since May 1958, this institute has been broadcasting experimental color television programs over its low-power transmitter on channel 5. Persons who were shown concert television programs and color films on this channel praised the quality of the color picture.

The Television Laboratory of the Leningrad Electrical Engineering Institute has also developed compatible color television equipment.

The Leningrad All-Union Scientific Research Institute of Television of the State Committee for Radioelectronics of the Council of Ministers USSR has developed a full set of equipment for one variant of the compatible system of color television ($4.43 \frac{R-Y}{B-Y}$) for the Moscow Television Center, where an experimental color television station will begin operation in 1959.

The Leningrad institute [of television] has also developed television sets with three-color picture tubes. Plants of the radio industry have been assigned to develop industrial models of color television sets and to produce the first small consignment of these receivers in 1959. The television sets will not differ very much from black-and-white sets in outward appearance. All color sets will be produced with a single size screen, measuring 53 cm diagonally. The reason for having only one size is that small picture tubes are no cheaper to make than the larger ones, in consideration of the complexity of applying three-color mosaics on their screens.

Scientific research institutes and specialists must select the best variant of a compatible color television system, and must test it thoroughly. The equipment should be improved and it should be made as simple and inexpensive as possible. Many problems concerning intercity transmission of color television programs via cable and radio relay lines must be solved. USSR institutes are working on these problems now. -- A. Kakunin, Deputy Minister of Communications USSR (Moscow, Radio, Jan 59, pp 10-12)

The television studio of the Scientific Research Institute of the Ministry of Communications USSR is broadcasting experimental color television programs. Special picture tubes are needed for watching them.

The [Moscow City] Sovnarkhoz has reviewed the problem of organizing the production of color television picture tubes. One of the enterprises of the Administration of the Radio Engineering Industry and Instrument Making will begin organizing their production. A laboratory section for making fine-mesh screens for the picture tubes is being organized. An experimental consignment of color television picture tubes will be produced in 1958. (Moscow, Vechernyaya Moskva, 3 Oct 58)

The All-Union Scientific Research Institute of Television in Leningrad has completed the manufacture of an experimental model of a color television receiver.

This receiver has 26 tubes and its picture tube measures 500 x 375 mm. A large group of designers under the direction of engineers L. I. Baldin and V. G. Semenov participated in the development of this new set,

blueprints of which have been distributed among radio engineering enterprises of Moscow and Leningrad. Series production of these television receivers will be started in 1959. (Moscow, Izvestiya, 28 Sep 58)

D. Television Receivers

Rubin-102 television sets are assembled at the Moscow Television Equipment Plant (4). (Moscow, Radio, Dec 58, p 64)

(4) Photo available in source, front cover

The Moscow Television Equipment Plant has pledged to produce 2,500 above-plan television sets (5) in honor of the 21st Congress of the CPSU. (Radio, Jan 59, third page of center folder)

(5) Photo showing a girl working on a fully assembled television chassis available in source, third page of center folder, top, right

One of the enterprises of the Moscow [City] Sovnarkhoz [Moscow Television Equipment Plant] has developed the Almaz-102 12-channel table model television set, which can also receive ultrashort-wave radio broadcasts.

The Almaz-102 features keyboard tone controls and a remote volume and brightness control. It utilizes a rectangular picture tube; 19 midget tubes, 17 of which are used for television reception; and 11 semiconductor detectors.

Another notable feature of the Almaz-102 is the highly effective automatic gain control switching circuit, whereby the DC component is not disrupted; and the special contrast control circuit, which maintains the black level automatically.

Two speakers in front, and one on the side of the set produce a stereophonic effect. (Moscow, Sovetskaya Aviatsiya, 30 Dec 58)

The Leningrad Plant imeni Kozitskiy is one of the oldest enterprises in the USSR. This advanced socialist enterprise was developed from old primitive shops inherited from the capitalists. This is the plant that first began the production of T-1 Leningrad television sets, the first made in the USSR, and later the T-2 Leningrad television sets. In 1954 it began to master the production of Avangard television sets.

In October 1957, the plant laboratory, which is headed by Klibson, developed the Soyuz, Znamya, Mir, and Yubiley television sets. The Znamya is 12 kg lighter than the Avangard, and has 15 tubes instead of 18. The employment of standard subassemblies in the Znamya makes it cheaper to produce.

The first Znamyas produced by the plant had certain "bugs" that had to be ironed out: tuning trouble, instable picture, and poorly mounted loudspeakers. Complaints began to arrive from purchasers of these sets. After a conference on quality control was held by the plant party committee, steps were taken to remedy these defects. Liventsov, plant director, spoke at the conference.

In 1958, the plant's Shop No 2 produced tens of thousands of Znamya television sets, more than 5,000 of these above the plan.

The plant has now mastered the series production of a new television set, the Znamya-58. The first consignments of these sets have already gone on sale. The plant is now preparing for the production of the small 13-tube table-model Yubiley television set, which was designed by specialists headed by Communist Izyumov. This set has a 360 x 270 mm screen and weighs 23 kg; it can receive 12 channels. (Moscow, Agitator, No 2, Jan 59, pp 42-45)

The Znamya-58 is a modernized version of the well-known Znamya television set. It is a 12-channel set that has 15 tubes, 7 semiconductor diodes, and one 43LK2B picture tube. Its screen measures 255 x 340 mm. The radio-frequency stage is built according to a superheterodyne system. The intermediate frequencies are 34 and 25 mc for video and 27 and 75 mc for audio.

The set's sensitivity is at least 200 microvolts; selectivity is at least 31 decibels on the adjacent channel: vertical image definition is 500 lines in the center of the screen and 400 lines on the edge; horizontal image definition is 450 lines in the center and 400 on the edge.

The audio frequency band width of the set is from 100 to 6,000 cycles with an 8 decibel variation. The sound pressure of the 2GD3 and 1GD9 loudspeakers is at least 4 bars.

The set consumes less than 130 watts. Its cabinet measures 520 x 495 x 475 mm. Total weight of the set is 28 kg. It has a sharpness control on its front panel and has sockets for plugging in earphones and a record player.

(Source gives detailed information on the Znamya - 58.) (Moscow, Radio, Jan 59, p 33)

The Aleksandrov Radio Plant has produced its first consignment of the improved Rekord-3 television sets. This set is an improvement over the old design [Rekord] television set in that it has 12 channels instead of 5. Many plastic parts are used in the new set; its production cost has been lowered considerably. (Moscow, Leninskoye Znamya, 3 Oct 58)

The radio engineering industry has developed the small Yubiley television receiver (6), which has 13 miniature tubes and receives 12 channels. Its sensitivity amounts to 275 microvolts, and its screen measures 350 x 250 mm.

It may be powered from a 110-, 127-, or 220-volt AC source. Input power does not exceed 125 watts. (Moscow, Vestnik Svyazi, Jan 59, inside front cover)

(6) Photo available in source, inside front cover, bottom left

The Belarus'-5 table model combination television, radio, and phonograph is produced by the Minsk Radio Plant. It receives television broadcasts on 12 channels and radio broadcasts on the long-, medium-, short-, and ultrashort-wave bands; and it plays standard and long-play records.

The television has 18 tubes and 14 semiconductor diodes. The screen measures 270 x 360 mm. Sensitivity on all 12 channels is in the order of 75 microvolts, which assures reliable reception at a distance of more than 100 km. Image quality is assured through the use of automatic gain and brightness control, inertial line-frequency control, and a special system for improving image definition. There are two speakers.

The sensitivity of the radio is at least 500 microvolts, in the long and medium wave bands, about 100 microvolts in both short-wave bands, and 10-15 microvolts in the ultrashort-wave band.

The two-speed (33 and 78 rpm) record player has a piezoceramic pick-up arm with permanent sapphire needles. Input power is 160 watts.

The cabinet measures 520 x 520 x 520 mm, and the tentative price is 3,000 rubles. (Moscow, Novyye Tovary, No 12, 1958, p 5)

## VI. COMMUNICATIONS EQUIPMENT

Engineers of the Leningrad Krasnaya Zarya Plant, in collaboration with the workers of the Scientific Research Institute of Municipal and Rural Telephone Communications, have developed a 100-number crossbar telephone subexchange for buildings. Communications between subscribers is effected by means of a so-called crossbar connector.

This substation's installation will cut expenses for line equipment.

The subexchange will be series-produced; the first one will be finished by 7 November 1958. (Leningradskaya Pravda, 8 Oct 58)

The new Rekord telephotographic apparatus has been designed at the Leningrad Scientific Research Institute of the State Committee for Radio-electronics of the Council of Ministers USSR by leading designer Ya. S. Greydinger and engineers V. M. V'yushin and L. M. Borisenko. Models of this wirephoto device have successfully undergone tests, and the institute is completing documents for their series production. (Moscow, Sovetskaya Rossiya, 2 Oct 58)

The Rekord receiving and sending telephotographic apparatus (7), developed by one of the scientific research institutes of the radio engineering industry, is designed for use in local communications and for the organization of intradepartmental and intraproduction communications. It is small and easy to operate, and can be serviced by persons with limited skills.

The Rekord can operate on intracity and intradepartmental telephone lines and on the channels of line-addition equipment. The image is received on ordinary paper by the electromagnetic application of a pigment. The device transmits an image measuring 220 x 150 mm in 6-7 minutes [as the drum rotates] at the rate of 120 rpm.

The Rekord was developed by a team of engineers including I. I. Frenkel, Ya.S. Greydinger, S. I. Sheblanov, and S. R. Shaks. It was demonstrated at the Brussels World's Fair, where it was awarded the Grand Prix along with many exhibits in the Soviet pavilion. (Moscow, Vestnik Svyazi, Jan 59, p 28)

(7) Photo available in source, p 28

[Comment: Since the responsible institute was freely identified in the previous source, the apparent reluctance of this source to identify it may have some significance.]

A group of engineers and designers of the Riga VEF Plant and the Scientific Research Institute of the Radio Engineering Industry has developed a new telephone set (8), which is superior to currently produced models in both appearance and performance. Models of the new set have already undergone plant testing, and the plant is currently preparing for the production of an experimental series of the new sets for testing under operating conditions. They are table sets for a central-battery automatic telephone exchange.

The new set is expected to be produced in a variety of colors. It measures 230 mm in length, 147 mm in width, and 114 mm in height. (Moscow, Vestnik Svyazi, Jan 59, p 20)

(8) Photo available in source, p 20

## VII. COMPUTERS

Except for one small privately owned adding machine plant, there was no computer machinery manufacture to speak of in prerevolutionary Russia. The development of computer machinery and its application in accounting, planning, and computing operations began only under the Soviet government. Soviet scientists and inventors have developed a number of first-class keyboard computers, card punches, and electronic computers. In 1950 alone, more than 20 different types of keyboard computers and card punches were designed. Among these are a reproducing card punch; an electronic reproducing card punch; an automatic sorter; several models of a set of 80-column card punches; a set of alphabetic card punches; a summary card punch which operates positionally (analagous to the reproducing card punch), resulting in a productivity several times higher than that of the IP-80 card punch; an electronic tabulator possessing broad operational capabilities; and other machines.

Planning is being completed on the development of an electronic sorter with a productivity of 50,000-60,000 card columns per hour, or 2.5 times the productivity of ordinary card sorters.

Significant successes have been achieved in the design of electronic high-speed computers. Since 1950, more than ten types of these machines have been developed. A model has been made of an electronic computer which multiplies 15-figure numbers at a speed of 500,000 operations per second. It adds 2 million numbers per second.

Especially great achievements have come about in the development of analog computers. About 20 such machines, developed by Soviet scientists and designers, are in operation in the USSR.

From 1947 to 1958, USSR industry produced 3.5-3.8 times as many computing machines as it did during the 10 years preceding World War II. About the same number of machines were imported from abroad as were produced [1947-1958]. In the USSR at the beginning of 1958, there were about 161,000 computing machines, excluding adding machines. In 1946, according to survey data, there were only 21,900 computing machines in the country.

The network of machine accounting offices, centers, and plants is expanding continuously, as can be seen from the following table:

| Year | Offices | Centers and Plants | Total |
|---|---|---|---|
| 1950 | 581 | 233 | 814 |
| 1953 | 2,185 | 415 | 2,600 |
| 1954 | -- | 488 | -- |
| 1956 | 2,412 | 652 | 3,064 |
| 1957 | 2,601 | 730 | 3,331 |
| 1958 | -- | 877 | -- |

Of the 877 machine accounting centers and plants in existence on 1 January 1958, 68 were machine accounting plants and grouped (kustovoy) machine accounting centers, which began to rise in number after the reorganization of industry and construction.

As a whole, the development and utilization of computer machinery does not meet the requirements of the national economy. Basic deficiencies exist in the designing of card punches. Although some attention is given to the use of high-speed components in designing card punches, practically no attention is given to the over-all development of sets of computers. Thus, the problem of lowering labor consumption in preparatory operations at machine accounting centers remains an urgent one.

A higher degree of backwardness is seen in the designing of electronic digital and analog computers, because of the slowness with which machines are put into production and set up for operation.

There is also a lag in the development of automation equipment for primary calculation, for automation and simplification of the processing of primary documents, and for the production and control of punched cards. These stages of the accounting and planning process are the most labor-consuming and the accuracy and precision of the processed data depend on them.

Initial processing of documents could be done with simple inexpensive units, such as the line-at-a-time "Ormiga" unit, which is used successfully at enterprises in Czechoslovakia. These units are just as productive as expensive tabulators, which are in short supply. Unfortunately, USSR industry is not producing such units.

The problem of automatic registration of preliminary data is especially important in connection with the utilization of electronic digital computers in accounting; without automatic registration it is impossible to effect a sharp cut in the labor consumption of work transferred to machines or in the time it takes to process input data, since the preliminary operations are still done manually or with manually operated machines.

Without automatic registration of preliminary data, it is impossible to solve the central problem involved in the utilization of computers: the over-all mechanization of planning, accounting, and computation operations.

Scientific research work in the development and operation of computers is on the rise. During the last 2-3 years, in addition to the existing Institute of Precision Mechanics and Computer Engineering of the Academy of Sciences and the NIISChETMASh [Scientific Research Institute of Computer Machine Building], scientific research institutes in Yerevan and Tbilisi and several special design bureaus have been organized. However, the main cause of the lag in designing various types of computers is the inadequate number of people working on problems of computer engineering and the inadequate scientific training of most of these people.

The institutes and bureaus have practically no experimental and laboratory facilities; plants do not have research laboratories. The development of computers is also held up by the lack of specialized institutes and bureaus for devising special components based on new physical principles. These problems must be solved rapidly.

The production of computers is unsatisfactory from both a quantitive and a qualitative standpoint. There is a shortage of equipment for computing and accounting operations. According to the "Soyuzmachuchet" [All-Union Machine Accounting Administration?] of the Central Statistical Administration USSR, very few of the orders for card punch machines are filled by industry. In 1957, only 16 percent were filled. In 1958, orders have also been placed, but only 20 percent of them can be filled in accordance with the plan for industrial production.

There is no doubt that these orders do not reflect the actual requirements of enterprises and organizations for computing machinery, since the mechanization level of accounting, planning, and other work remains extremely low.

The demand for analog and, especially, digital electronic computers is being met to an even less satisfactory degree.

The production of mechanical and electromechanical computing machines, such as keyboard and card-punch types, is insufficient. Only five different types of keyboard machines are being produced. Industry is not producing special auxiliary machines for the basic card-punch machines, sorters, and tabulators. Such machines would make it possible in many cases to automate a number of operations and to simplify the accounting process. Most important of all, industry has failed to produce multiplying or calculating electronic reproducing card punches and automatic sorters, although such machines were developed long ago. It is high time at least to begin the production of reproducing card punches.

The production of simpler, yet extremely necessary, keyboard computing machines is insufficient. Such machines include full-keyboard computing, algebraic adding, invoicing, and accounting machines. The VK-1 and VK-2 ten-key computing machines and the SDU-138 listing-type calculating machine (schetno-tablichnaya mashina) are unreliable in operation.

Alphabetic card punches are badly needed for the development of machine accounting and computations, especially in agriculture. Experimental models of these machines exist, but USSR industry is still not producing them.

Gosplan USSR and the sovnarkhozes that have computer machine building plants under their jurisdiction neglect the production of improved computers, which are widely used in economic calculations. Instead, they give preference to machines designed for mathematical calculations and to the simplest analog machines produced, which are mainly assembled out of finished parts and components supplied by enterprises of the radio industry.

The main reason for backwardness in the production of computers is the limited production facilities for this purpose. Comparatively small, poorly equipped plants with low degrees of specialization are engaged in this production.

Further mechanization of accounting, planning, and computing operations depends not only on increasing the production of computing machines, but also on utilizing available computing machines properly.

(Source gives additional information on the use of computers.) (Moscow, Bukhgal'terskiy Uchet, Dec 58, pp 16-23)

Machines are not used in most accounting work because too few are produced. There are no simple multiplication units; no invoicing or accounting machines are produced, even though the Podol'sk Typewriter Plant (Podol'skiy zavod pishushchikh mashin) was to have produced experimental models of invoicing machines based on the Moskva typewriter.

The Kiyevskiy Sovnarkhoz was given an order whereby it was to obtain the type VMM-2 automatic multikey computing machines. However, several quarters have passed and it has not received the machines. The supplier plant has informed the sovnarkhoz that it has delayed sending out the contract for supplying the machines because the Kurskiy Sovnarkhoz has not approved the selling price for them. Since it should not take so long to approve the price, it would seem that the production of these machines has not yet been organized.

The mass importation of keyboard computing machines from abroad began in 1949. Many of these machines have been in operation for 8-9 years and have to be overhauled; some of their parts have to be replaced. The supply of spare parts for them is organized poorly. During the first half of 1958, the [Kiyevskiy?] Sovnarkhoz did not get a single spare part for such machines. One must be satisfied with promises. With regard to the supply of parts for domestically produced machines, there are no limits on spares for SDU-110 and SDU-138 machines; very negligible limits exist for spare parts for card punches. (Moscow, Bukhgal'terskiy Uchet, Dec 58, p 30)

The Scientific Research Institute of Computer Machine Building has designed the PR80-2 high-production electromechanical automatic reproducing punch (9) for supplementing a set of 80-column card punches.

The PR80-2 increases the speed of duplicating punched cards to eight or ten times that of the P80-2 one-digit card punch.

In addition to duplicating, the PR80-2 punch with the necessary adjustment can be used for reproducing, i.e., taking one copy of each punched card from the old set. It is designed also for combined reproducing or transferring marks from the master card by the duplicating method.

The PR80-2 can be used with a tabulator as a high-production summary punch. The T-5M tabulator when used with the PR80-2 for summary punching is 1.5-2 times as productive as when it is used in a set with the IP80 summary punch.

The PR80-2 can check the punching accuracy of 80 columns simultaneously. It is adjusted for duplicating and reproducing by using replaceable inserts in the switchboard and the proper settings of switches. It is adjusted for punching summary data from a tabulator by means of multiplug connections, a switchboard, and switches.

The reproducing and duplicating mechanisms and electric drive system are the main subassemblies of the machine. The electrical equipment is powered by 110 volts DC.

Specifications of the PR80-2 reproducing punch are as follows:

| | |
|---|---|
| Maximum productivity (No of punched cards) | 6,000/hr |
| Rate of feed (No of punched cards) | 100/min |
| Capacity of feed magazine (No of punched cards) | 750 |
| No of receiving boxes | 4 |
| Capacity of receiving boxes (No of punched cards) | 700 |
| Dimensions (length x width x height) | 1,200 x 450 x 1,240 mm |
| Weight | 350 kg |

(Moscow, Byulleten' Tekhniko-Ekonomicheskoy Informatsii, No 10, 1958, pp 37-38)

(9) Photo available in source, p 37

In 1958, the Laboratory of Machine and Computer Mathematics of the Academy of Sciences Kazakh SSR, received the EV-80-3 computer and the IPT-5 analog computer.

The EV-80-3 is a high-speed electronic digital computer. It can be used for addition, subtraction, multiplication, division, and a number of logic operations. Data are fed into the computer on punched cards. It processes 80 punched cards per minute on the same program. A program consists of 32 stages, which are arithmetic and logic operations. The results are in the form of perforations on either the original set or on a new set of punched cards.

The computer can operate with three sets of punched cards simultaneously, e.g., it takes data from two sets of cards and records results on a third set of cards. The results are received in digital form after the set of punched cards with total calculations has passed through the printer. The T-5 tabulator is used for this purpose by the laboratory.

The EV-80-3 can be used for processing a large volume of initial information when the processing is mathematically uncomplicated. During the process of calculation, the sets of punched cards can be put through the machine repeatedly, at which time the program can be changed. The laboratory intends to use the machine for mechanizing the calculation of reserves of mineral resources. The electronic computer has already been installed and made ready for operation. Test checks of the average contents for an oil well, which has had 101 samples on three components, took 4 min of machine time for the EV-80-3 and 4 min of printing time for the T-5. An experienced calculating machine operator on an automatic keyboard would require 8 hours to do this amount of work even under the best conditions. The machine does all the calculations twice and automatically compares the results each time. If the results are different, i.e., if there is an error in one of the checks, the machine stops to give the operator an opportunity to find the source of the error. Two results arrived at independently are punched on the card and they are compared automatically.

The machine can be used successfully for many engineering calculations. It is especially convenient for processing statistical data.

The machine was transferred to the laboratory without cost by the Computer Center of the Academy of Sciences USSR and put into operation in Alma-Ata.

The IPT-5 is an analog computer. It can reproduce and fix processes described by systems of ordinary differential equations with constant or variable coefficients. The system's equations can be both linear and nonlinear. They are used extensively for solving problems of automatic control, in which case it is possible to link up the computers with equipment actually in existence.

The IPT-5 has not yet been installed, but it will soon be put into operation. -- M. V. Pentkovskiy, Academician of the Academy of Sciences Kazakh SSR (Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, No 1, 1959, p 101)

Yu. Ivlichev, a worker of the Institute of Automatics and Telemechanics of the Academy of Sciences USSR, has developed a series of original computing devices (10) operating on compressed air. They are extremely simple, compact, reliable, and accurate, and can be used in laboratories and for industrial automation. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 3 Oct 58)

(10) Photo showing Ivlichev working on a pneumatic computing device available in source, p 2, top, right

## VIII. PRECISION EQUIPMENT

### A. Instruments

#### 1. General Information

The following measuring instruments have been approved for use in the USSR by the Committee on Standards, Measures, and Measuring Instruments:

Dosimetric-type indicator with plant designation SD-1-M, Belorussian Sovnarkhoz

Lever-and-gear multiple measuring head (micrometric indicator), LIZ [Leningrad Tool Plant], Leningradskiy Sovnarkhoz.

AC universal bridge with plant designation UM-3, Leningradskiy Sovnarkhoz

Single-phase ferrodynamic panel recording wattmeters with plant designation N-383, ZIP [Krasnodar Electrical Measuring Instrument Plant], Krasnodarskiy Sovnarkhoz

AC High-voltage bridge with plant designation R-525, [Kiev] Tochelektropribor Plant, Kiyevskiy Sovnarkhoz

Sparkproof megohmmeter with plant designation M1102, [Kiev] Tochelektropribor Plant, Kiyevskiy Sovnarkhoz.

Voltammeter with plant designation M108/1, [Leningrad] Vibrator Plant, Leningradskiy Sovnarkhoz. (Moscow, Izmeritel'naya Tekhnika, No 1, 1959, p 64)

In 1965, the production of instrument-making equipment will have increased to 2.5-2.6 times that of 1958. The growth of measuring equipment will be just as extensive. The production capacity of the instrument-making industry will be expanded significantly as a result of the construction of new plants and the reconstruction of existing plants. (Moscow, Izmeritel'naya Tekhnika, No 1, 1959, p 2)

A chief design engineer, design and production engineers, design and production technicians, an engineer-economist for labor and wages, and a draftsman are needed for a newly organized norm-setting and design bureau for instrument making.

Applications should be made at the personnel division of the Fizelektropribor Plant, Elektrozavodskaya ulitsa 33, Moscow. -- Advertisement (Moscow, Vechernyaya Moskva, 3 Oct 58)

2. Electrical Instruments

The Leningrad Plastic Products Plant imeni Komsomol'skaya Pravda supplies parts to two plants which manufacture electric meters. One of these, the Leningrad Electrical Machinery Plant, long ago introduced improvements which reduced the weight of the housing of these meters to 1.1 grams while maintaining the same quality.

The Vil'nyus [Electric Meter] Plant, which produces the same type of meter, would appear never to have learned of the improvement by the Leningrad plant, but this is not true. Specialists of the Leningrad Plastic Products Plant have suggested adoption of these improvements to the Vil'nyus plant management, which, however, cannot accept these suggestions because it fears complaints.

True, the Vil'nyus plant recently suggested an improvement which saves 6 tons of brass per million electric meters, but these savings could be substantially increased by the adoption of the Leningrad plant's improvement. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 26 Sep 58)

Specialists of the Yoshkar Ola Electrical Instrument Plant (Mariyskaya ASSR) have designed a new automatic machine for sorting selenium elements of small diameters according to electrical para-meters. Ten of these units are now being manufactured by the plant on an automatic line attended by one person, who replaces the 80 persons needed to do the sorting manually. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 26 Sep 58)

The Leningrad Vibrator Plant is the producer of the type N-11 automatic eight-loop oscillograph, which has been in operation on one of the 110-kv transit lines of Yarenergo [Yaroslavl' Electric Power Administration?]. Such oscillographs have also been in operation on the lines of Mosenergo [Moscow Regional Electric Power Administration]. (Moscow, Elektricheskiye Stantsii, 11 Nov 58, pp 86-87)

The USSR-made type Ts-23 pocket voltmeter (11) is designed for checking the voltage of electric circuits in radio receivers, television sets, and tape recorders. It indicates 50-cycle AC Voltage within a range of 50-250 v.

Its input resistance (sensitivity) is about 500 ohms per volt. The reading error does not exceed plus or minus 4 percent. The voltmeter costs 65 rubles. (Moscow, Novyye Tovary, Jan 59, p 6)

(11) Photo available in source, p 6, bottom

The Kishinev Electrical Measuring Instrument Plant (zavod elektroizmeritel'nykh priborov) is now under construction. The plant, located in the southeast section of Kishinev, will be housed in a white stone four-story building, which is going up opposite a square next to the railroad station. The construction site covers an area of more than 4,000 sq m.

The first stage of the plant is to go into operation on 10 October 1958. The assembly shop is located on the second floor. Oscillographs, the basic product of the plant, will be assembled here.

Plant personnel have already begun the development of certain components for electrical measuring instruments. Maksim Grigor'yevich Litvin, chief engineer of the plant, states that the lathe and milling machine section of the machine shop and the fitters section of the assembly shop have already gone into operation. The plant is being equipped with various metal-cutting machine tools and presses, heat treatment equipment, and electroplating equipment.

According to Litvin, the tool, machine, press, electroplating, assembly, and experimental shops will go into operation in 1958. A special design bureau, which will develop new types of oscillographs and other electrical measuring instruments, is being organized at the plant. During the fourth quarter of 1958, the plant will make its first products: 50 type POB-14 portable oscillographs.

A few days ago, Yevgeniy Sigizmundovich Borisevich, deputy director of the Institute of Terrestrial Physics of the Academy of Sciences USSR and inventor of the POB-14 oscillograph, visited the plant and made a high appraisal of the construction and installation work now under way.

However, the construction is not going along as well as it should. The plumbing work is behind schedule. A boiler has not yet been installed in the boiler house. Although more than 150 workers of various trades are employed on the construction project and strive to do their work properly, only 5-6 persons daily are doing plumbing work. This fact is neglected by the Administration of Construction of the Moldavian Sovnarkhoz, which is in charge of the Moldsantekhmontazh Trust [Moldavian Plumbing Installation Trust], the organization doing the plumbing work.

Telephone line installation work is also going along slowly. By right, the plant should have its own automatic telephone exchange. [apparently it will not have its own].

It is hoped that the plant will go into operation by 7 November 1958. (Kishinev, Sovetskaya Moldaviya, 30 Sep 58)

3. Electronic Instruments

Dozens of new electronic measuring instruments and radio receivers have been developed and put into production at the Tallin Punane RET Plant.

V. A. Toodo, deputy chief designer of the plant, has developed an electronic ohm-resistance meter, with direct dial readings (12). (Moscow, Pravda, 11 Oct 58)

(12) Photo available in source, p 1, top, right

The GSS-28m standard signal generator (13) is designed for testing radio receivers, antennas, and other radio equipment. This device is a source of ultrahigh-frequency oscillations which are calibrated by frequency, power, modulation frequency band, and pulse duration and frequency.

The range frequencies of the generator extends from 3,750 mc to 7,500 mc, and frequency error does not exceed plus or minus 2 percent of the rated value of the scale. The output is 10 milliwatts on the milliwatt outlet and $10\text{-}2.10^{-8}$ microwatts on the microwatt outlet. The GSS-28m is powered from a 110-, 127-, or 220-volt AC source, and its input power amounts to 300 volt-amperes. (Moscow, Vestnik Svyazi, Jan 59, inside front cover)

(13) Photo available in source, inside front cover, bottom right

A television oscillograph (14) has been designed for checking television circuits. It can operate with both periodic and driven sweeps. Its specifications are as follows:

| | |
|---|---|
| Frequency band of periodic sweep | 1 cycle - 1 mc |
| Band of driven sweep | 100 milliseconds - 1 microsecond |
| Time markings on oscillograph screen | 0, 0.5, 0.1, 1, and 10 microseconds |
| Maximum sensitivity | |
| For vertical deflection | 0.25 mm/root-mean-square millivolt |
| For horizontal deflection | 50 mm/root-mean-square volt |

This oscillograph has frequency characteristics that are practically rectilinear. The characteristics of the vertical amplifier range from 20 cycles to 15 mc. Those of the horizontal amplifier range from 10 cycles to 1.8 mc. The unit has a high-ohm and a 75-ohm input, and also an input through an extension probe.

The unit is supplied from a 110-, 127-, or 220-volt 50-cycle AC circuit and has an input power of about 500 volt-amperes.

The oscillograph has been developed by a plant of the radio engineering industry in accordance with a technical assignment from the Ministry of Communications USSR. Very soon, industry will begin its series production. (Moscow, Vestnik Svyazi, Feb 59, inside front cover)

(14) Photo available in source, inside front cover, botton, right

4. Industrial Controls

In 1954, the Moscow Manometr Plant was producing extrahigh-pressure manometers, rotameters, various types of differential manometers, type EPID electronic differential transformer instruments, automatic electronic indicator bridges, and many other complex instruments.

The plant now has a products-list of more than 400 type-sizes of various instruments. Some are produced in large series and others in medium series; however, the plant produces only one or two of certain types of instruments per year. Such variety requires good production planning.

The plant is the producer of the OM-200 manometer, the RED rotameter, the EPID, EPD, and EMD automatic electronic secondary instruments, and the DM-6 instrument. The Manometr Plant has a constant-speed conveyer on which electronic instruments are assembled (15).

On 1 April 1957, some of the plant shops went on a 7-hour workday.

Significant reductions in norm-hours required to produce various instruments occurred at the plant between 1956 and 1957, as shown in the following table:

| Product | Labor Consumption per Unit (norm-hours) First half of 1956 | Second half of 1956 | First half of 1957 |
|---|---|---|---|
| EPD-12 potentiometer | 175.9 | 133.5 | 88.1 |
| EMD-212 balancing bridge | 151.8 | 116.3 | 78.0 |
| EPID-04 secondary instrument | -- | 192.0 | 111.4 |
| MPO manometer | 10.7 | 7.2 | 6.0 |
| EKM-1 manometer | 7.1 | 6.2 | 5.7 |
| MA manometer | 1.9 | 1.8 | 1.6 |
| MKD-2 manometer | 23.7 | 18.7 | 15.5 |
| K-10r manometer | 2.5 | 2.3 | 2.0 |
| AM-1 manometer | 3.6 | 3.3 | 2.8 |
| NM-890 strain gauge | 16.8 | 15.5 | 13.6 |
| DM-16 transmitter | 98.6 | 70.6 | 49.6 |

The plant, which operated with 7-hour shifts from April to December 1957, fulfilled its annual program, which had been calculated for 8-hour shifts, ahead of schedule. -- Petr Aleksandrovich Lachugin, Director, Moscow Manometr Plant

(Source contains several photographs of plant shops and sections.) (Rabochiy Den'-Sem' Chasov (A Seven-Hour Workday), book by P. Lachugin, Moscow, 1958, pp 4, 6, 17, 23, 29, 37, 43, 46, 47, 48)

(15) Photo available in source, p 29

5. Automation Equipment

The Nal'chik Tsvetmetpribor Plant went into operation recently. It manufactures automatic draining equipment; electronic nugget detecting devices; and signaling, interlocking, and blocking equipment for use in underground electric locomotive transport. The plant makes almost 70 different types of products.

A. Shashenkov, director of the Tsvetmetpribor Plant, said that the Moscow Tsvetmetavtomatika Design Bureau serves the plant. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 24 Sep 58)

The Institute of Automatics of Gosplan Ukrainian SSR has developed a telemechanical system for controlling gas wells and is testing an industrial model of it (16). (Moscow, Radio, Jan 59, 2d and 3d pages of center folder)

(16) Photo available in source, 2d and 3d pages of center folder, bottom, center

The Leningrad Lenneftekip Plant has developed and produced experimental models of automatic regulators for changing the pressure of gas in gas pipes.

Recently, it finished assembling the first regulators, which were shipped to various cities of the USSR for industrial testing. Soon a large consignment of these new instruments will be shipped to Tuapse, where a liquefied petroleum gas filling station is under construction. (Leningradskaya Pravda, 11 Oct 58)

6. Hydrometeorological Instruments

Sh. Gurabanidze, chief engineer of the Tbilisi Gidrometpribor Plant, states that his plant is currently producing more than 40 type-designations of instruments which are used by hydrologists, meteorologists, aerologists, and agrometeorologists in such places as the Angarskaya, Bratskaya, and Kuybyshevskaya GES (Hydroelectric Power Stations), on drift stations in the Arctic Circle, in Antarctica, in the Kurile Islands and on Sakhalin, at the construction site of the Karakum Canal, in the virgin lands of the Kazakh SSR, and in the Pamir and El'brus mountains.

During recent months, the plant has shipped instruments to the United Arab Republic, Afghanistan, China, and the Vienna International Fair. They are also exhibited at the Brussels World's Fair.

After the high quality of these instruments had been demonstrated in Mexico and Argentina, an order for bathometers was received from Brazil. (Tbilisi, Zarya Vostoka, 25 Sep 58)

An ARIV-52 radio-anemometer was installed in the Kuybyshev Reservoir in August. This is an automatically operating meteorological station having sensitive elements which detect the temperature and humidity of the air, the direction of the wind, and the temperature of the water. It is mounted on a buoy.

This device was manufactured under the direction of Magil'ner, a leading engineer of the Scientific Research Institute of Hydrometeorological Instrument Making.

The signals of this station may be transmitted by telegraphic code to distances of 100 km. The ARIV transmits data every 6 hr, but in winds of more than 6 meters sec, it transmits every hour.

Radio-anemometers are used in the service of the river fleet. Two more of these stations are expected to be installed in the Kuybyshev reservoir in 1959. (Moscow, Izvestiya, 28 Sep 58)

The Agrophysics Scientific Research Institute has developed a semiconductor thermometer which replaces 500 mercury thermometers. It consists of a semiconductor thermistor with two leads that connect to a measuring instrument. It weight 3-4 grams.

The Kalinin Radio and Electrical Machinery Plant will mass-produce these semiconductor thermometers. (Moscow, Vechernyaya Moskva, 24 Sep 58)

7. Other Instruments

A group of workers of the Leningrad Agrophysics Institute under the leadership of I. Korobochkin, Candidate of Technical Sciences, have developed a new instrument called the tractor traction work meter. This instrument carries out an accurate computation of all work done by a tractor. By the end of 1958, 2,500 work meters will be produced.

Workers of the institute are also producing a large consignment of semiconductor thermometers, which are needed for measuring the temperature of the soil to determine the right time for sowing corn and other heat-loving crops.

New microthermometers for determining the temperatures of the surfaces of vegetable and animal fabrics and instruments for measuring soil temperatures from a distance have also been developed.

The new semiconductor instruments for agriculture have been developed under the leadership of academician A. F. Ioffe. (Alma-Ata, Kazakhstanskaya Pravda, 3 Oct 58)

The assembly shop of the [Frunze] Physical Instrument Plant is assembling an apparatus for paper electrophoresis. N. V. Yalovega, chief designer of the plant, said that this instrument requires very delicate and complex adjustment. It was put into production in August. The first 25 instruments will have been manufactured by the end of September.

The galvanizing shop has begun using crystallite instead of nitrocellulose enamel plating because it is more durable. (Frunze, Sovetskaya Kirgiziya, 28 Sep 58)

The Saransk Elektrovypryamitel' Plant is the producer of the type AMI-60 oil-testing apparatus, the AKI-50 cable-testing apparatus, and the type KII-70 apparatus for testing hard and liquid dialectics at up to 50 kv DC or 50 kv AC.

(Source gives additional information on the above-mentioned apparatuses, along with illustrations). (Moscow, Elektricheskiye Stantsii, Nov 58, pp 83-85)

B. Motion-Picture Apparatus

The Leningrad Kinap Plant is the sole producer and supplier of photographic developing machinery (17) in the USSR. It recently started producing the Type 9P developing machine, which has the largest capacity of any machine produced by this plant to date. Three of these machines have already been shipped to Mosfil'm in Moscow, and two more are in production.

The 9P machine, which is about 14 meters in length, can operate at six speeds, turning out from 80 to 900 meters of film per hour. Both color and black-and-white film can be developed simultaneously in the 9P. (Leningradskaya Pravda, 20 Sep 58)

(17) Photo showing assembly of developing machine (probably the 9P) available in source, p 4, top

The Leningrad Kinap Plant has pledged to produce in 1958, above its planned assignment, 300 KUP-56 mobile amplifiers, five sets of KZVT-4 amplifiers, five sets of KZM-6 [units], and five sets of 60P developing machines. It has pledged to produce ahead of schedule a 40P-2 laboratory-type developing machine; to manufacture test models of a new universal mobile transistor amplifier for KPU-59 [units]; and to master the production of eight type-designations of capron parts. It will also introduce the use of high-quality enamel in painting series-produced KZM-5, KZM-6, KZVT-4, and KZVT-5 equipment.

The Moscow Kinap Plant will complete its annual assignment for the production of Rodina and Konvas-Avtomat movie cameras by 10 December.

The Moscow Design Bureau of Motion-Picture Apparatus will complete the manufacture of an experimental model of the 16-SS movie camera by 1 December 1958. (Moscow, Tekhnika Kino i Televedeniya, Dec 58, p 2-3)

At present, the Leningrad Lenkinap Plant and the NIKFI [Scientific Research Motion-Picture Photography Institute] are developing a universal semiconductor audio amplifier for mobile motion-picture units. This amplifier has an output power of 15 watts and is designed for the reproduction of sound from film tracks and tapes.

The Leningrad Kinap Plant is getting ready to produce the first consignment of 90U-2 amplifiers, which utilize two type P6D semiconductors in their preliminary amplifiers. Experimental models of projectors with semiconductor components will soon be sent to motion-picture display organizations.

(Source has additional information on the use of semiconductors in audio amplifier systems, and several illustrations). (Moscow, Kinomekhanik, Jan 59, p 38)

The Kiev Kinodetal' Plant and the Scientific Research Motion-Picture Photography Institute have developed the KPP-2 Kiev projector for showing panoramic movies taken on three 35-mm films. (Moscow, Kinomekhanik, Jan 59, p 31)

Since 1952, the Rostov Cinema Apparatus Plant (Rostovskiy zavod kinoapparatury) has been producing the KPM-800 stationary motion-picture projector utilizing an incandescent lamp. This projector is based on the earlier SKP-26 and KZS-22 projectors, which have been taken out of operation. Since 1952, the plant has produced more than 1,000 KPM-800 projectors, which are operating successfully in many motion-picture theaters.

However, the plant's tentative 1959 plan does not include the continuation of the production of the KPM-800, despite the great demand for them. The Main Administration of Motion-Picture Installation and Film Rental RSFSR says that they are not needed because industry has mastered the production of KN-12 projectors.

However, the production of KN-12 projectors cannot have any influence on the production of KPM-800 projectors, since the illumination power of the KPM-800 is double that of the KN-12. Thus the KPM-800 can serve a larger audience. Moreover, not enough KN-12 projectors are produced to meet the demand.

Why does the production of extremely necessary projection apparatus have to be curtailed? -- B. Grushevskiy, Chief Engineer, Rostov Cinema Machinery Plant (Rostovskiy kinomekhanicheskiy zavod) (Moscow, Kinomekhanik, Jan 59, p 30)

The plan for the creation of a dense network of motion-picture installations in the USSR is still impeded by the shortage of projection apparatus, especially such equipment as the types KPT-1, SKP-35, and KShS. The Main Administration of Supply and Sales of the Ministry of Culture USSR must work harder at making sovnarkhozes fulfill the orders of the ministry. (Moscow, Kinomekhanik, Jan 59, p 3)

C. X-Ray Equipment

Yakov Semenovich Beletskiy is the director of the [Teplyy Stan] Mosrentgen Plant. The plant is engaged in socialist competition with the Leningrad Burevestnik Plant and the Kuntsevo Elektroshchit Plant (Kuntsevskiy zavod "Elektroshchit").

Recently, workers of the plant's central design bureau, in collaboration with the Leningrad State Optical Institute and other scientific organizations, developed an electrical-optical amplifier for X-ray apparatus. The amplifier makes it possible to increase the brightness of an X-ray image to 1,000 times the ordinary intensity. An experimental model of this amplifier has been built and is undergoing tests successfully.

The electrical-optical amplifier is a small lightweight attachment for an ordinary X-ray apparatus. Two microscopes, located one on each side of the tube, facilitate careful medical observation of areas of bodily ailments.

The plant is testing a powerful stationary diagnostic X-ray unit, the RUM-10. (Moscow, Leninskoye Znamya, 10 Oct 58)

D. Industrial Ultrasonic Equipment

In setting up ultrasonic metal processing equipment, it is very difficult for some branches of industry to design and produce a high-power electric oscillator.

In such cases, the 600-watt TU-600 relay amplifier, which industry is series-producing, can be used. When operating in the 19-20-kc band, the lowering of the output power of the amplifier does not exceed 15-20 percent. The ZG-2, ZG-10, LIG-40, and other industrial-type audio oscillators can be used for the excitation of the amplifier. If no audio oscillators are available, it is very simple to make a one-tube master oscillator, which can be connected to the input of the first line of the amplifier or the second stage of a microphone amplifier. Such a master oscillator is installed inside the frame of the amplifier. The supply voltage is obtained from one of the kenotron rectifiers of the TU-600 amplifier.

Ultrasonic units for machining hard materials built on the base of the TU-600 are successfully operated by a number of organizations.

In addition to the TU-600, the UDL-350 high-frequency oscillator, which has also been put into production by USSR industry, can be used after certain high-frequency circuit adjustments have been made. (Ul'-trazvuk i yego primeneniye v mashinostroyenii (Ultrasonics and Its Application in Machine Building), book by Izmail Samuilovich Vaynshtok, Moscow 1958, p 55)

E. Traffic Radar

A radar unit has been designed by the Giprotransсignal svyaz Institute [State Institute for Planning Traffic Signals and Communications?] for detecting traffic law violations. This new device, which consists of a small box containing radar and camera suspended above the street of wires, is being introduced by the Administration of Militia of the Executive Committee of the Leningrad City Soviet. When the radar detects a speed violation, it trips the release of a movie camera which photographs the vehicle involved. An inset in the upper corner of the photograph shows both the speed of the vehicle and the time the violation occurred.

Other devices currently undergoing tests include a cybernetic automatic traffic signal light and a "hornless" device for signaling the driver of an overtaken vehicle that the one behind desires to pass. (Moscow, Izvestiya, 26 Sep 58)

## IX. ELECTRICAL PRODUCTS

### A. Switches and Relays

Design Bureau No 7 of the former Ministry of Machine Tool Building and Tool Industry has made a series of types MP10-MP60 wear-resistant microswitches for checking the path and operation of individual units of semiautomatic or automatic machines or mechanisms.

Microswitches have been developed for use in both temperate and tropical climates.

Series MP microswitches with momentary switching and return of the contacts have one normally open and one normally closed contact with a common electrical point. They are designed mainly for AC circuits up to 380 volts, and also for DC circuits up to 220 volts if special protective units are used.

The following modifications of the series of wear-resistant microswitches have been made:

An open microswitch with a buffer and a spare stroke after contact of 1.5 mm (the type MP10 has a right contact and the MP11 a left contact). An open microswitch without a buffer (high precision) and a spare stroke after contact of .12 mm (the type MP20 has a right contact and the MP21 a left contact).

An enclosed microswitch (in a case) with lever and roller (the type MP30 has a right contact and the MP40 a left contact) and with lever and roller on the short side of the case (the type MP40 has a right contact and the MP41 a left contact).

An open microswitch with lever and roller (types MP50 and MP51). An open microswitch with buffer and spare stroke after contact of 5 mm (types MP60 and MP61).

The MP10 is the basic model of this series of microswitches. The others are modifications which differ only in the design of the clamping device.

Tests made on experimental model microswitches have demonstrated their mechanical durability (not less than 5 million switchings). The electrical durability, with power rating and switching frequency of up to 2,000/hr, is not less than 1.5 million contacts. The permissible number of switchings is 2,000-3,000 per hour. If there is a lower switching frequency and noncontinuous operation, the switches have a greater commutation capacity.

The Khar'kov Electrostanok Plant will manufacture this series of wear-resistant microswitches. (Moscow, Byulleten' Tekhniko-Ekonomicheskoy Informatsii, No 10, 1958, pp 32-35)

Because the electrical industry is so slow in putting into production modern gas relays to replace existing relays, some power and systems have developed their own. One of these is the Volzhskaya GES (Hydroelectric Power Station) imeni Lenin, which has made its own gas relays. This should be notice to the electrical industry that it had better proceed with the mass production of modern gas relays immediately.

It is also necessary to accelerate the operational testing of an experimental consignment of improved gas relays made by the Moscow Transformer Plant, which have been given to power systems for testing. (Moscow, Elektricheskiye Stantsii, No 5, p 62)

B. Cable

According to preliminary figures for the development of the USSR national economy during the 1959-1965 period, the intercity network of communications cables will be doubled.

The basic task of cable communications workers is to fulfill this assignment through application of the most technically advanced and economically sound measures. This can be accomplished as much through the improvement of the qualitative indexes of existing types of line equipment as through the introduction of new, more advanced systems.

One basic means for a considerable reduction in the cost of cable equipment, as pointed out in the theses of Khrushchev's speech for the 21st Congress of the CPSU, is utilization of aluminum and plastics in the production of cable. It should be emphasized that the replacement of lead armor with aluminum not only cuts the cost of cable communications 30-40 percent, but also substantially increases resistance to the influence of extraneous electromotive force and lightning. Industry should organize the production of aluminum-clad cables, which are well protected from corrosion; and cable communications workers should develop simple and dependable methods of splicing such cables. The introduction of aluminum armor will doubtlessly facilitate the conversion to aluminum cores in both balanced and coaxial cable, which in turn will lead to further cost cuts.

The advantages of plastic insulation for cables are irrefutable. Such cables are easier to manufacture, are moistureproof, and have stable characteristics and high electrical strength. The broad development of the chemical industry will facilitate the mass production of such cables and their extensive application in communications, especially in rural radio and telephone installation.

A reduction in the costs of intercity cables, coaxial cables in particular, can be achieved through improvements in design. The employment of more advanced designs with smooth seams, a reduction in the size of the return conductor, and a cut in the amount of polyethylene scrapped will permit a 15-20 percent reduction in the cost of coaxial cable, and an increase in the structural length will permit a reduction in the costs of laying, installation, and transport.

A considerable reduction in the costs of city telephone cables may be achieved through application of star twists of the cores instead of paired twists, and bundled twists instead of spread twists, and of 0.4-mm cores instead of 0.5-mm core diameters. -- V. O. Shvartsman, Candidate of Technical Sciences, Senior Scientific Worker of TsNIIS [Central Scientific Research Institute of Communications] (Moscow, Vestnik Svyazi, Jan 59, p 12)

S. K. Rybak is the designer of a new insulating machine (18) installed in the power cable shop of the Moscow Moskabel' Plant. This machine consists of several separate units installed along a wall of the shop. (Moscow, Vechernyaya Moskva, 10 Oct 58)

(18) Photo available in source, p 2, top, right

The Kishinev Mikroprovod Plant is subordinate to the Administration of Local Industry, Council of Ministers Moldavian SSR. (Kishinev, Spisok Abonentov Kishinevskoy Gorodskoy Telefonnoy Seti (Directory of Subscribers of the Kishinev City Telephone Network), 1958, p 45)

The Berdyansk Azovkabel' Plant has 17 million rubles' worth of finished products in its warehouse. They have not been delivered because of a lack of railroad rolling stock. (Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 24 Sep 58)

C. Plant Information

The [Moscow] Prozhektor Plant was built during the First Five-Year Plan and last year celebrated its 25th anniversary. Work has recently been started on reconstruction of this plant, and is expected to be completed by the end of 1958. It will have seven shops, and all operations in the new building will be mechanized. Although production space has been reduced by one half, the plant is expected to fulfill its plan assignment. (Moscow, Moskovskaya Pravda, 26 Sep 58)

The personnel office of the Minsk Electrical Engineering Plant is located at Malaya Slepyanka, Minsk 9. (Minsk, Sovetskaya Belorussiya, 27 Sep 58)

The Moscow High-Frequency Electric Furnace Plant [Moskovskiy zavod vysokochastotnykh elektropechey] is located at ulitsa Krasina, 1/23, Moscow. (Moscow, Vechernyaya Moskva, 24 Sep 58)

D. Institutes

The Leningrad Institute of Aircraft Technology is the producer of the type UP-21 ultrasonic soldering gun (19). (Ul'trazvuk i yego primeneniye v mashinostroyenii (Ultrasonics and Its Application in Machine Building), book by Izmail Samuilovich Vaynshtok, Moscow, 1958, p 66)

(19) Photo available in source, p 66, top

GIEKI (State Research Electroceramics Institute) of Glavniiproyekt [Main Administration of Scientific Research and Planning Institutes] of Gosplan USSR has vacancies in the following positions:

Chief of the Electroceramics Division

Chief of the High-Frequency Measurements Laboratory

Chief of the Physicochemical and Structural Analysis Laboratory

It also has jobs open for senior scientific workers.

The institute is holding regular competive examinations for the position of chief of the Metal and Ceramic Joining Laboratory and for positions of senior scientific workers in various fields.

Applications should be made to the institute's director at Shosse Entuziastov 115, Moscow Ye-24. (Moscow, Vechernyaya Moskva, 30 Sep 58)

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